UNITED
NATIONS

TD

United Nations Conference
on Trade and Development

Distr.
GENERAL

TD/B/C.1/IRON ORE/8
13 August 1991

Original: ENGLISH

TRADE AND DEVELOPMENT BOARD
Committee on Commodities
Intergovernmental Group of Experts on Iron Ore
Fifth Session
Geneva, 21 October 1991
Item 4 of the provisional agenda

REVIEW OF THE CURRENT SITUATION AND OUTLOOK FOR IRON ORE - 1991

Report by the UNCTAD secretariat

This report describes developments in the world iron ore market in 1990 and in the first half of 1991. The main purpose of the report is to stimulate an exchange of views on the current situation and outlook for the international iron ore market. Detailed statistics appear in the document entitled "Iron ore statistics 1981-1990" (TD/B/C.1/IRON ORE/7) prepared by the UNCTAD secretariat.

GE.91-51461

CONTENTS

		Paragraphs
I.	Overview and summary	1 - 7
II.	Features influencing iron ore demand	8 - 28
	A. Steel production	10 - 16
	B. Pig iron production	17 - 19
	C. Sponge iron ore or directly reduced iron (DRI)	20 - 22
	D. Ferrous scrap	23 - 26
	E. Iron ore stocks	27 - 28
III.	Features influencing iron ore supply	29 - 72
	A. World market for agglomerated ores	31 - 36
	B. Regional developments	37 - 68
	Africa	38 - 44
	Asia	45 - 48
	Middle East	49 - 50
	Eastern Europe	51 - 53
	Rest of Europe	54 - 56
	Latin America	57 - 63
	North America	64 - 65
	Oceania	66 - 68
	C. Financing and investments	69 - 72
IV.	Trade in iron ore	73 - 78
V.	Iron ore prices	79 - 81
VI.	Transport costs and freight rates	82 - 83
VII.	Technological and environmental issues	84 - 102
	A. Technical and technological advances	85 - 92
	B. Environmental concerns	93 - 102
VIII.	Short-term outlook for iron ore	103 - 105

Annexes

I. Iron ore mining projects: new mines and capacity expansions - 1991

II. Iron ore mining projects: closures and capacity reductions - 1991

Tables

1. Apparent consumption of iron ore, 1981-1990

2. Major steel-producing countries, 1981-1990

3. Imports of pig iron and ferrous scrap by Japan, 1987-1990

4. Selected DRI producing countries with unused capacity

5. Selected DRI producing countries with production higher than installed capacity

6. Major iron ore producing countries, 1981-1990

7. World pellet exports, 1986-1990

8. Investment plans for iron ore, 1990-1991

9. Major iron ore trade parteners in 1990

10. Major iron ore exporting countries, 1981-1990

11. Iron ore imports into Japan, 1989-1990

12. EEC's iron ore imports by origin/destination, 1990

13. Eastern European iron ore imports by origin/destination, 1990

14. World seaborne iron ore trade, 1981-1990

15. Freight rates for iron ore in the single-voyage charter market, 1981-1990

Charts

1. World production of iron ore, pig iron and crude steel, 1981-1990

2. Evolution of scrap prices, 1988-1991

3. Iron ore prices, 1980-1991

I. OVERVIEW AND SUMMARY

1. Following three years of successive and significant increases, the iron ore market in 1990 slowed down in response to the lower level of world crude steel production. Despite the decline in world demand from the peak of 1989, however, the iron ore industry operated at high capacity rates in order to keep pace with world requirements. A good interplay of market forces helped to maintain the close balance between demand and supply; the softening of world demand for iron ore was offset by occasional disruptions in supplies which contributed to keeping the market very active throughout the year.

2. World iron ore production was nearly 974 million tons in 1990, the second highest level over the last 10 years, although 1.3 per cent lower than the record level reached in 1989. Despite the continuing growth of iron ore output in Latin America, the share of developing countries in world production slightly declined due to the sharp fall in Africa's output. The volume of iron ore mined in China continued to increase, but remained insufficient to meet the growing domestic demand. In the USSR, the largest producing country, output continued to drop sharply, affecting Soviet supplies to the world market. In developed market-economy countries, iron ore output declined in all countries in 1990, except in Australia and South Africa.

3. The volume of iron ore traded in the world market declined, and total exports amounted to 396.4 million tons in 1990, more than 5 per cent below 1989. The decline in the volume of trade was more accentuated than the decline in total output because a number of events such as war, strikes, fire, technical and loading problems, etc, affected the schedule of shipments in several exporting countries during 1990. Major iron ore trade flows remained unchanged, with Brazil and Australia leading the exporting side and Japan and Germany as major importers. Shipments increased only from Brazil and South Africa. The interruption of shipments from Liberia by the middle of the year resulted in the exclusion of this country from the list of the 10 major iron exporting countries. On the importing side, it should be noted that the Republic of Korea is presently the third major iron ore importing country, and China is currently among the 10 major importers. Contrary to expectations, trade with and between Eastern European countries sharply declined in 1990. As higher prices more than offset the lower volume of exports, the total value of world iron ore exports reached 8.75 billion US dollars in 1990, a record over the last 10 years. However, dollar fluctuations and the exchange rate policies of individual countries had a strong impact on the profitability of individual iron ore companies.

4. The long downward pressure on iron ore prices was reversed in 1989, when the iron ore market regained equilibrium. Since then, prices have been recovering year after year. However, despite the 31 per cent cumulative increase between 1988 and 1990 (about 14 per cent in 1989 and nearly 17 per cent in 1990), the 1990 nominal FOB price of the world reference ore was still around 5.2 per cent below its level of 1982. ($US 20,96/ton in 1982 against $US 19,87/ton in 1990). The 8 per cent increase in 1991 brought iron ore prices to their nominal level of 1982. In real terms, however, 1991 prices were still 26 to 30 per cent below their levels of the early 1980s.

5. In view of the growing awareness concerning the need to protect the environment, the iron ore industry has been more conscious of the effects of the rapid depletion of natural resources, and efforts are being made to implement monitoring programmes more compatible with environmentally sound mining activities. However, as iron ore is a low-value commodity, it has been extremely difficult, in particular for developing countries, to absorb the financial costs involved in pollution control activities, research on new environment-friendly technologies, and the implementation of remedial measures where damage already exists.

6. For the year 1991 as a whole, the iron ore market will be weaker, as compared to the boom years of 1989/1990. However, the declines which took place during the first half of the year are likely to be attenuated during the second semester, as a slight upturn in overall economic conditions of developed market-economy countries is expected during the last quarter of 1991. In addition, iron ore demand might be positively influenced by the rebuilding of stocks.

7. In 1992 world steel demand is expected to start rising again, bringing positive prospects for the iron ore industry. However, efforts by producers and consumers continue to be called for with a view to maintaining the present market equilibrium.

II. FEATURES INFLUENCING IRON ORE DEMAND

8. After three consecutive years of growth, and compared with the all-time record level of 1989, world demand for iron ore declined in 1990. However, the market remained very active and the level of world apparent consumption of iron ore remained relatively high throughout the year, amounting to 972 million tons (table 1). There was a steady demand for all marketable ores, although consumption of blast-furnace pellets softened.

Table 1

Apparent consumption of iron ore
(million tons)

Regions or countries	1981	1983	1986	1989	1990
Developed countries	432.8	307.0	357.6	398.9	393.1
of which:					
EEC	150.1	122.5	134.9	148.9	140.0
Japan	123.8	109.4	115.5	127.9	125.5
United States	98.6	48.3	51.9	72.1	70.3
Developing countries	81.1	90.5	131.1	142.9	142.8
of which:					
Latin America	32.6	37.6	57.4	59.6	61.6
Asia	39.0	41.5	56.5	68.4	68.0
Africa	3.3	4.7	9.3	8.2	7.6
Countries of Eastern Europe	261.0	260.8	263.4	252.8	241.8
of which:					
USSR	198.3	202.2	203.9	201.4	199.7
Socialist countries of Asia	115.8	122.8	161.2	184.4	193.9
of which:					
China	107.8	114.7	152.7	174.7	183.7
World total	890.7	781.1	913.3	979.1	971.6

Source: UNCTAD secretariat - "Iron Ore Statistics 1981-1990".

9. In 1990 there were changes in the shares of iron ore consumption of the different groups of countries. While the 1980s were characterized by an upward trend of iron ore consumption in developing countries, there was a stagnation in 1990 because the growth in Latin America was not sufficiently high to offset the slight decline in Asia and the persistently low level in Africa. In addition, pronounced declines for the second consecutive year in Eastern European countries have broken a long period of stable levels of iron ore consumption in that region. In contrast, rising iron ore consumption in China continues, and this country now accounts for 19 per cent of the world total. In developed market-economy countries, declines were apparently less than expected, thanks to the high level of consumption in Japan and the smaller than expected decline in the United States. During the first half of 1991, despite the gloomy first quarter marked by the uncertainties brought about by the Gulf war and the fears of a world economic recession, steel market developments and the consequent demand for iron ore, although slackening, have not shown an accelerated downward trend.

A. Steel production

10. In 1990 world demand for steel was less buoyant than in 1989, but remained relatively high. Worldwide crude steel output declined to 767 million tons, 2.2 per cent below the preceding year. The weakening of the steel market largely reflected the sharp contraction of steel consumption and production in Latin America (- 9 per cent), as well as in the Soviet Union and Eastern Europe as a whole (- 7 per cent). In contrast, the expansion of steel production in Asia continued, with remarkable increases in China, the Republic of Korea and Japan.

11. Almost 50 per cent of world steel output is produced in developed market-economy countries, where total production reached 377 million tons in 1990, 1.5 per cent below 1989. This slight decline resulted from the deceleration of economic growth in industrialized countries and consequent lower demand from the main steel-consuming sectors, in particular the automotive industry and construction. In the OECD,[1/] GNP grew by 2.8 per cent in 1990 compared to 3.6 per cent in 1989, and this declining trend affected the level of private non-residential investment and industrial production in most OECD countries. Japan was a major exception. In this latter country, the largest iron ore importer, crude steel production in 1990 increased for the fourth consecutive year, exceeding 110 million tons (+ 2.2 per cent), the highest level for the last decade. The Japanese economy was positively influenced by the high level of domestic steel demand, sustained the dynamism of the building and industrial machinery sectors, which both increased by more than 10 per cent, followed by a 5 per cent increase in the automotive industry.

12. In the EEC, crude steel production declined by 2 cent to 136 million tons in 1990, reflecting the slackening of economic growth in the Community's countries during the second half of the year. Despite the variations from country to country, the rate of inflation for the Community as a whole was slightly above 5 per cent, which had a negative impact on private consumption. Steel consumption in the EEC decreased by 1 per cent in response to the reduced output of car manufacturing, the mechanical industry, and to a lesser degree construction. Economic developments in the Community have recently been influenced by growing expectations concerning the implementation of the EEC single market in 1993, the recent liberalization in Eastern European countries, and German unification in 1990. The major iron ore consuming country in the EEC, namely Germany, had a drop of 6 per cent in steel output, which decreased to 38.4 million tons in 1990. Declines also occurred in the United Kingdom, the Netherlands and Spain, while small increases were registered in France, Belgium and Italy.

13. In North America, steel production was 3 per cent lower in 1990 due exclusively to the sharp drop of Canadian output by more than 20 per cent, since in the United States - contrary to some pessimistic forecasts - the volume of steel output slightly increased, as shown in table 2.

14. The steel industry of the USSR and other Eastern European countries has been facing enormous difficulties; weaker investments, combined with a sharp decline of economic activity (the net material product declined by 4 per cent in 1990),[2/] aggravated the already precarious conditions of the current period of transition from centrally planned to market economies. The disruption of established economic linkages caused a sharp drop in industrial output in general and in steel and iron ore in particular, which fell for the third consecutive year. Total crude steel production in the Soviet Union and other Eastern European countries stood at 203 million tons in 1990, a drop of 7 per cent from the level of 1989. The fall was very pronounced in Romania, the former German Democratic Republic and Bulgaria (32, 29 and 25 per cent respectively). Moderate declines occurred in Hungary, Poland, Czechoslovakia and the USSR. However, even after the 4 per cent decline in its output to 154 million tons in 1990, the Soviet Union remained the world's largest crude steel-producing country.

Table 2

Major steel-producing countries, 1981-1990
(million tons)

	Country	1981	1983	1986	1989	1990	1990/89 change %
1.	USSR	148.5	152.5	160.5	160.1	154.3	-3.6
2.	Japan	101.7	97.2	98.3	107.9	110.3	2.2
3.	United States	109.6	76.8	74.0	88.8	88.9	0.1
4.	China	35.6	39.0	52.2	61.4	67.2	9.4
5.	Germany, Fed. Rep.*	41.6	35.7	37.1	41.1	38.4	-6.4
6.	Italy	24.8	21.8	23.0	25.2	25.4	0.9
7.	Republic of Korea	10.7	11.9	14.5	21.9	23.1	5.7
8.	Brazil	13.2	14.7	21.2	25.0	20.6	-17.7
9.	France	21.2	17.6	17.7	18.7	19.0	1.7
10.	United Kingdom	15.6	15.0	14.8	18.8	17.9	-4.7
	World total	708.4	662.5	713.2	784.3	766.9	-2.2

Source: UNCTAD secretariat - "Iron Ore Statistics 1981-1990".
* Prior to unification

15. Despite the fact that developing countries together still account for less than 15 per cent of world crude steel output (chart 1), their upward trend was reversed in 1990 because steel output fell considerably in Latin America (by 9 per cent) to 38.6 million tons, reflecting the depth of the economic crisis in the region. Apart from the significant increase in Mexico

(10 per cent), steel consumption and production dropped in almost all other Latin American countries. The sharp decline of almost 4.5 million tons in Brazil had an adverse effect on the overall output of the region, since this country produces around 55 per cent of the regional total.[3/] Conversely, at the same time, in developing countries of Asia total steel output further increased, mainly in the Republic of Korea (5.7 per cent) and Turkey. In Africa, crude steel output declined further to the very low level of 3 million tons, less than 0.5 per cent of world total.

16. The Chinese iron and steel industry continues to enjoy steady growth. In 1990, China produced more than 67 million tons, an increase of more than 9 per cent over 1989. China continues to be a major market for steel and has great potential to further develop its steel industry to meet the growing requirements of its population, which presently consumes only about 50 kilograms of steel per capita.

B. Pig iron production

17. Following the developments of the steel market, world pig iron production also declined from the historical high level of 546 million tons reached in 1989 to 532 million tons in 1990. The share of developed market-economy countries in world pig iron output has been decreasing slightly, mainly because modernization has been responsible for the reduction of ironmaking capacity, particularly in the United States and Japan. On the other hand, China's pig iron output continued to increase, and exceeded 62 million tons in 1990. In developing countries, pig iron output has been growing in the new industralizing countries such as the Republic of Korea, where production exceeded 15 million tons in 1990, almost three times higher than in 1980. Brazil, despite the recent decrease in output from 24 million tons in 1989 to 21 million tons in 1990, continued to be a major producer thanks to the new ironmaking capacity put into operation during the last five years. In the USSR, as well as in all other Eastern European countries, pig iron output declined as a whole by 6 per cent in 1990, although it remained the main input for steelmaking in the region.

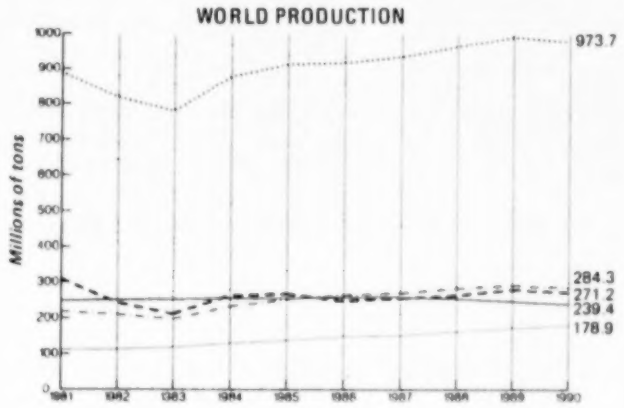
18. Preliminary estimates indicate that pig iron trade probably reached 10.5 million tons in 1990. The main suppliers to the world market continued to be the USSR and Brazil, but both countries experienced a decline in their pig iron shipments last year for the following reasons:

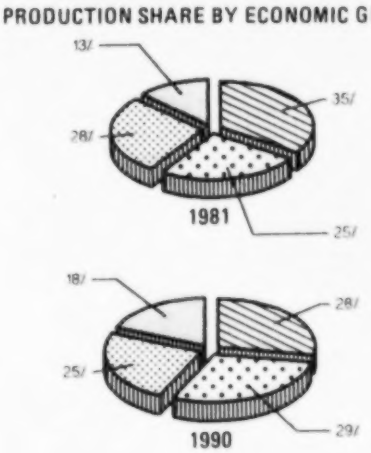
- Even although the Soviet Union was the top exporter to Japan in 1990 (accounting for about 40 per cent of Japanese imports), the USSR's pig iron exports were affected by its lower level of output caused by labour strikes at major coal mines. It is noteworthy that, as a result of "perestroika", the destinations of Soviet pig iron exports are being re-oriented from Eastern Europe towards South-East Asian countries. The share of the former decreased from more than 95 per cent of Soviet pig iron exports in 1985 to 65 per cent in 1989, while the share of the latter increased from 4 per cent in 1986 to 35 per cent in 1989. This trend might be further accentuated since as from 1991, payments for Soviet exports to Eastern European countries are expected to be made in hard currencies. Another new issue is that the Soviet Government is considering the possibility of imposing export duties on a number of strategic items, including pig iron and ferrous scrap.

Chart 1

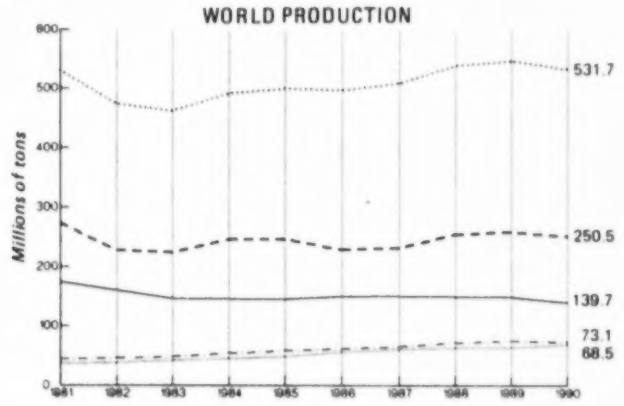
WORLD PRODUCTION OF IRON ORE, PIG IRON AND CRUDE STEEL

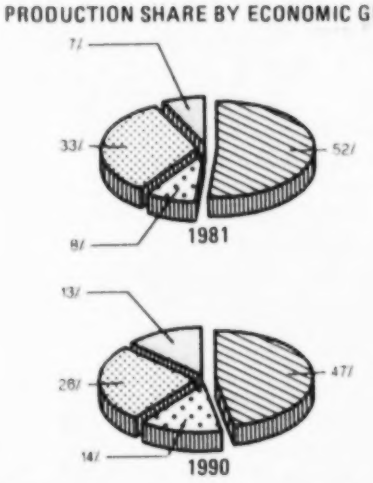
IRON ORE



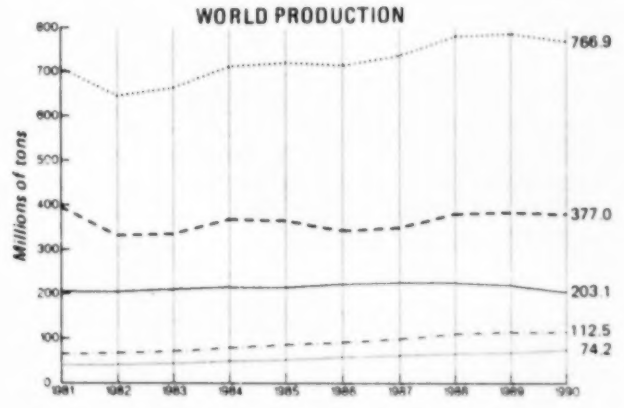


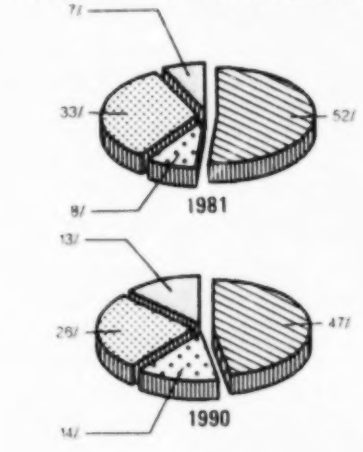
PIG IRON





CRUDE STEEL





World
Developed Market-Economy Countries
Developing Countries
Countries of Eastern Europe
Socialist Countries of Asia

Developed Market-Economy Countries
Developing Countries
Countries of Eastern Europe
Socialist Countries of Asia

Source: UNCTAD secretariat

- In the case of Brazil, total pig iron output declined by 13 per cent in 1990, not only due to the drop in domestic demand resulting from the deepening of the recession, but also due to escalating production costs caused by new environmental legislation regulating the use of charcoal by pig iron producers. As a consequence, many plants are being closed and a number of planned projects re-assessed. In addition, although competitively priced for the world market, Brazilian pig iron exports were negatively affected by the exchange rates for the Brazilian currency which prevailed last year.

19. If pig iron continues to be price competitive vis-à-vis scrap taking into account quality differentials, there will be a potential for further trade expansion. Developments which took place in the Japanese market over the last few years point in this direction. In 1990, Japan imported over 3 million tons of pig iron, its highest level, while ferrous scrap imports declined for the third consecutive year (table 3).

Table 3

Imports of pig iron and ferrous scrap by Japan, 1987-1990
(million tons - rounded figures)

Pig iron					Ferrous scrap				
Origin	Years				Origin	Years			
	1987	1988	1989	1990		1987	1988	1989	1990
China	0.3	1.3	0.5	0.4	USA	0.4	0.7	0.3	0.5
USSR	0.4	0.5	0.7	1.3	USSR	0.4	0.2	0.2	0.1
Brazil	0.1	0.4	0.7	1.0	Australia	0.3	0.2	0.1	-
South Africa	0.3	0.3	0.2	0.1	Netherlands	0.1	0.1	-	-
Australia	0.2	0.2	0.1	0.2	Viet Nam	-	-	0.2	0.1
Total (including others)	1.4	2.9	2.3	3.3	Total (including others)	2.4	1.8	1.1	1.0

Source: UNCTAD secretariat - "Iron Ore Statistics 1981-1990"

C. Sponge iron or direct reduced iron (DRI)

20. Worldwide sponge iron production increased significantly last year, from 15.6 million tons in 1989 to 18 million tons in 1990. Global demand for DRI has been growing continuously since 1984, but still represents less than 2 per cent of the world supply of iron material. Nevertheless, the DRI market has benefited from the deteriorating quality and rising prices of ferrous scrap,

the substitute for sponge iron in electric-arc furnace steelmaking. In addition to its low-residual levels, the consistency of its chemical and physical characteristics, and its easier handling, shipping and storage, the price stability of merchant DRI has contributed to pushing up world demand for it over the last few years.

21. However, practically all direct-reduced iron is consumed locally and there are very few export-oriented DRI plants. Despite recent improvements, international trade in sponge iron was estimated at 2.2 million tons in 1990, which represented only 12 per cent of total output. The limited availability of DRI or HBI (hot briquetted iron) has apparently been an obstacle to the further expansion of merchant DRI exports. Nevertheless, there are still some issues which might deserve to be considered:

(a) First, given the persistently low rate of capacity utilization, which still oscillates around only 60 per cent of total installed capacity, the rationale for commissioning 4.3 million tons of new capacity in 1990 may be questioned, particularly in countries where production in 1990, although higher than in 1989, was still substantially below the capacity of 1989. Table 4 presents some illustrations in this regard. It would seem that efforts should focus on ways and means of increasing the utilization of existing capacity before contemplating investing in new capacity. Indeed, the available information presented in table 5 below shows that in some countries it was possible to reach production levels that even significantly exceeded installed capacity both in 1989 and 1990;

Table 4

Selected DRI producing countries with unused capacity

Country	DRI capacity		DRI production	
	1989	1990	1989	1990
Libyan Arab Jamahiriya	0.55	1.10	0.09	0.50
Mexico	3.03	4.03	2.23	2.54
Venezuela	4.50	5.93	2.44	3.08

Source: Based on information from Midrex Corporation and UNCTAD.

Table 5

Selected DRI producing countries with production higher than installed capacity

Country	DRI capacity		DRI production	
	1989	1990	1989	1990
Argentina	0.93	0.93	1.17	1.03
Qatar	0.40	0.40	0.53	0.57
Saudi Arabia	0.80	0.80	1.20	1.09
USSR	1.67	1.67	1.70	1.69

Source: Based on information from Midrex Corporation and UNCTAD.

(b) Second, it might be difficult for sponge iron to remain as commercially attractive as it was in 1990 if the price of scrap grade No. 1 continues to decline so sharply, as was the case during the first half of 1991 (chart 2).

22. Developing countries, mainly those well-endowed with natural gas, are the major sponge iron producers, and they now account for 75 per cent of world output. Venezuela is the leading country, and for the first time its output exceeded 3 million tons or more than 17 per cent of world production in 1990; a new plant (SIDECAR) was inaugurated in Venezuela in early 1991 to supply SIVENCA's steel works. Mexico ranks second, with 2.5 million tons in 1990, followed by the USSR with almost 1.7 million tons. Saudi Arabia and Argentina both produced over 1 million tons. In Asia, India continues to increase its capacity and production, Indonesia and Malaysia further increased their output, and Thailand is considering the construction of a DRI plant to meet the growing demand of electric steelmakers. Another region with potential for further expansion is the Middle East, since the direct reduction electric arc furnace steelmaking route is widely used in the region. In view of the success of the DRI plants in Saudi Arabia, Egypt and Qatar, further growth is expected in the Libyan Arab Jamahiriya and the Islamic Republic of Iran.

D. Ferrous scrap

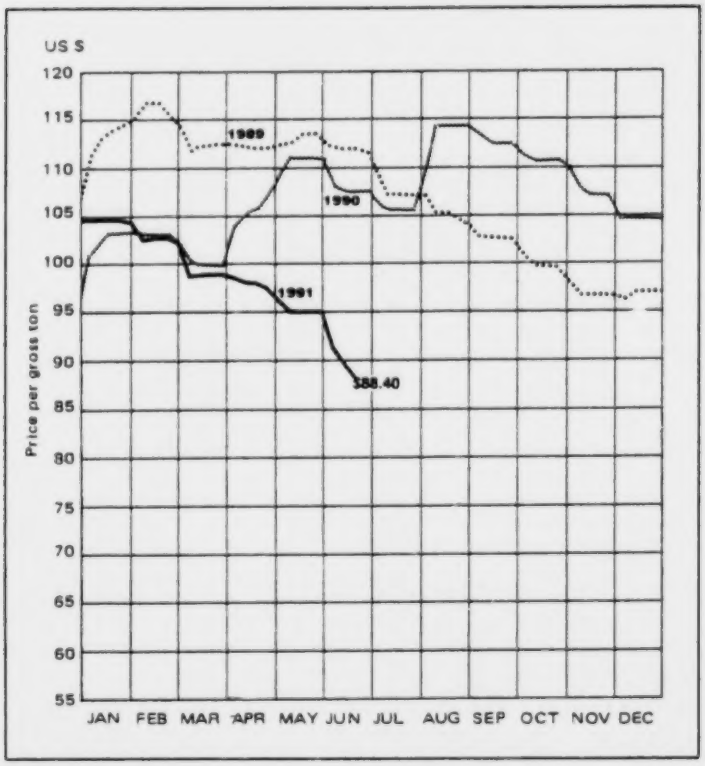
23. The ferrous scrap market remained steady in 1990 despite the fierce price competition between primary iron (pig iron and sponge iron) and secondary iron (ferrous scrap) in steelmaking countries. The usual fluctuations in scrap prices were less accentuated last year, when the composite price for No. 1 grade ranged between $US 100 and 112 per long ton in the American market (chart 2). However, with the slackening of steel production, notably during the last quarter of 1990, scrap prices were under pressure and turned sharply downward during the first half of 1991.

24. Ferrous scrap trade in 1990 might have reached 31 million tons. Although scrap exports from the United States in 1990 were below the record of 1989, this country maintained its top exporter position and accounted for more than one third of world ferrous scrap exports. Other major scrap exporters include Germany, France and the United Kingdom. Scrap exports from the USSR have been declining over the last few years, and this trend is likely to continue in the near future unless the Government succeeds in re-establishing the internal scrap collecting system, which is in jeopardy because scrap fixed prices in local currency are unattractive and do not induce collectors to modernize and become more efficient.

Chart 2

EVOLUTION OF SCRAP PRICES

Metal Market Weekly Steel Scrap Price Composite



Source: American Metal Market, June 1991.

25. The pattern of the world scrap market is also changing. In the 1980s, five developed market-economy countries accounted for half of world imports of ferrous scrap. Recently, however, several developing countries have been emerging as major world importers. For instance, in 1989, the Republic of Korea imported 4 million tons, while Japan imported 1.1 million tons; the opposite situation occurred in 1984. India and Indonesia are now important scrap importers. In Latin America, over 15 million tons of scrap are consumed, but the region's reliance on imports has been declining in recent years in view of the increasing efficiency of scrap recycling, particularly in Brazil; only in Mexico are scrap imports still increasing. In China, in view of the shortage of domestically generated scrap, imports increased in 1990 to meet the growing requirements of the steel industry.

26. Since about 350 million tons of ferrous scrap are consumed by the world iron and steel industry, which represents about 40 per cent of their needs in terms of iron units, the scrap industry has to find solutions to the problems affecting its competitiveness, in particular in terms of quality. The ferrous scrap industry, which according to a recent study[4/] accounts for almost 95 per cent of all scrap metals recycled, is more and more compelled to introduce new scrap processing and recycling technology in order to comply with new environmental rules (See chapter VII below).

E. Iron ore stocks

27. Although iron ore demand slowed down during the second half of 1990, a number of developments provoked disruptions in supply and contributed to maintaining a tight balance between demand and supply of iron ore throughout 1990, including during the last quarter. In addition to technical difficulties and transportation or loading problems, these developments included: the interruption of deliveries from Liberia; strikes, in particular the Hamersley strike in Australia at the end of the year; and a fire which affected Swedish shipments. To minimize the effects of supply bottlenecks, the majority of mines were running at full capacity and shipping from stocks. Consequently, the level of stocks by the end of the year was, with a few exceptions, low in both producers' and consumers' plants. This helped to strengthen the producers' position during the round of price negotiations for 1991.

28. Iron ore inventories decreased in almost all major producing countries. In consuming countries, they were also low, mainly in Japan where they were 4 million tons lower than the previous year (15.2 million tons in 1990 compared to 19.2 million tons in 1989). In the United States, while consumers' stocks were 3.1 million tons lower, at 18.2 million tons, producers' stocks were almost unchanged, at 4.8 million tons. (For further information on stocks,7see tables 19, 20 and 20-A of "Iron Ore Statistics - 1981-1990" - TD/B/C.1/IRON ORE/7.)

III. FEATURES INFLUENCING IRON ORE SUPPLY

29. A close balance between world supply and demand for iron ore was maintained in 1990. World production declined to 973.7 million tons, but this 1.3 per cent decline followed six consecutive years of growth, which culminated in a historic peak in 1989 when global output reached 986 million tons. Last year's output was, however, sufficient to keep efficient mines operating at high levels. Global output in Fe content was 557 million tons, indicating that the average iron content of 57 per cent has been maintained over the last decade.

30. Iron ore production is not concentrated in any of the four economic groups of countries considered; there is at least one major producer in each of these groups. In 1990, iron ore output increased in Asia, Latin America and Oceania but declined in all other regions. Developing countries as a group maintained their share of world production at 29 per cent of the world total, as the sharp drop in Africa's output was to some extent offset by the increase in that of Latin America. The biggest producing countries maintained their world position (table 5). The four largest producing countries, which produce above 100 million tons a year each, account together for almost 70 per cent of world iron ore output.

Table 6

Major iron ore producing countries, 1981-1990
(million tons, natural weight)

	Country	1981	1983	1986	1989	1990	1990/89 Change %
1.	USSR	242.4	245.0	250.0	241.3	236.0	-2.2
2.	China	104.4	110.3	140.6	162.1	169.3	4.5
3.	Brazil	97.9	92.1	129.0	153.7	154.4	0.4
4.	Australia	84.7	71.5	94.0	105.8	112.0	5.9
5.	United States	75.5	38.5	39.5	57.9	55.5	-4.2
6.	India	41.6	38.1	51.2	51.4	50.0	-2.8
7.	Canada	52.0	33.3	36.7	41.1	35.8	-13.1
8.	South Africa	28.3	16.6	24.5	30.0	30.3	1.1
9.	Sweden	23.4	13.5	20.5	21.8	19.9	-8.7
10.	Venezuela	15.5	9.5	16.2	18.1	20.1	+11.5
11.	Mauritania	8.5	6.6	9.3	12.1	11.4	-5.8
12.	Liberia	19.5	15.4	15.6	12.3	4.0	-67.6
World total		890.1	778.0	914.7	986.2	973.7	-1.3

Source: UNCTAD secretariat - "Iron Ore Statistics 1981-1990"

A. World market for agglomerated ores

31. In line with overall developments, world demand for agglomerated ores declined in 1990. However, contrary to the situation which prevailed in 1988/1989, the market for sinter was more dynamic than that for pellets. Total pellets production declined by 4.5 per cent, while that of sinter was only 3.0 per cent lower than the previous year.

Sinter

32. In 1990, world sinter output totalled 547 million tons, compared to 563 million tons in both 1988 and 1989.[5/] This modest decline seems to confirm that, regardless of the long-term downward trend of sinter production resulting from both growing concerns about pollution controls and the ageing of a number of sintering plants, demand for sinter normally declines relatively less than that for pellets in times of stagnating or declining steel production as ocurred in 1990. Sinter remains the most used blast furnace charge in Japan and Europe, and is also the preferred charge of the fast-growing steel producing countries in developing Asia.[6/]

33. The USSR, EEC and Japan together produced 62 per cent of world sinter output for their own consumption. A rehabilitation programme for sintering plants is under way in Eastern Europe with a view to improving the environmental situation and the quality of the sinter produced in that region. Another 1990 event was the entry into full operation of the Philippines sintering plant which produced 4.4 million tons of high-quality self-flexing sinter, exported in totality to Japan. PSC (Philippine Sinter Corp.) has one of the world's largest plants and provides the only case of a plant importing iron ore and exporting sinter since 1977.

Pellets

34. After an upward trend which reached a peak in 1989, world demand for pellets has been weakening since the beginning of 1990. Lower consumption of pellets in blast furnaces has been only partially offset by the increase in pellet usage in direct reduction plants, where in most cases pellets account for 70 per cent of total ore requirements. In 1990, the pellet market was affected by the interruption of supply from Liberia (about 3.3 million tons), and this contributed to a decline in the total output of pellets to 225 million tons.

35. Since the FOB price of DRI pellets is higher than that of pellets for blast furnaces, and since demand for DRI pellets might expand faster, most of the expansion in pelletizing capacity is oriented towards the growing DRI market. New plants are envisaged in Venezuela and Sweden. It should be noted, however, that in 1990 apparently only 21 million tons of DR-grade pellets were produced worldwide, out of a total DR pelletizing capacity estimated at 45.7 million tons.7/

36. Due to the cutbacks in steel production in North America, the sharpest decline in pellet output in 1990 occured in the United States and Canada. In Brazil, a similar situation prevailed. Output in the USSR was slightly lower and amounted to 68 million tons. In Sweden nearly 10 million tons of pellets were produced in 1990, virtually the same volume as the year before, but this country is considering the construction of a fourth pellet plant. In Peru, pellet production was further reduced to only 1.3 million tons due to shortages of energy. Pellet trade contracted in 1990 (table 7) and accounted for 30 per cent of world pellet output.

Table 7

World pellet exports, 1986-1990
(million tons)

Country	1986	1987	1988	1989	1990
Brazil	22.2	20.0	23.4	23.3	20.0
Canada	17.5	13.1	17.6	17.3	12.8
USSR	10.9	10.8	10.9	10.7	10.3
Sweden	6.2	6.1	6.5	6.5	6.5
Chile	3.0	3.3	3.5	3.6	3.4
Liberia	3.2	3.2	3.2	3.3	1.5
United States	4.5	5.0	5.2	2.9	3.0
India	0.1	0.8	1.6	1.9	1.8
Australia	1.7	2.1	2.0	1.6	1.7
Peru	1.5	1.7	1.5	1.5	1.2
Venezuela	-	0.4	0.8	1.2	1.2
Norway	-	-	0.9	1.0	1.2
World total	71.0	66.7	77.8	74.9	68.6

Source: UNCTAD secretariat - "Iron Ore Statistics 1981-1990".

B. Regional developments

37. Developments in iron ore production and supply capacity which took place in 1990 and the first half of 1991 are reviewed below by region.

Africa

38. In 1990 the share of African countries in world supplies of iron ore was considerably reduced and represented only 2 and 4 per cent of world output and trade respectively. The drastic cutback in Liberian production was the reason for the decline. At present, there are eight African countries producing iron ore, namely: South Africa, Mauritania, Liberia, Algeria, Egypt, Zimbabwe, Tunisia and Morocco. The main extraction and beneficiation facilities in operation are concentrated in South, North and West Africa.[8/]

39. South Africa remained the major iron ore producing and exporting country in Africa. Its iron ore output increased considerably by nearly 40 per cent during the 1987-1990 period, reaching 30.3 million tons, thanks to the high production rates of the hematitic deposits at Sishen Mine, the largest in the country. Iscor, a former State-owned company which exploits the main ore deposits and has the largest steel complexes in the country, has been investing massively and has succeeded in improving the quality and productivity of its ore, which in the past had been penalized by its chemical composition, in particular its high alkali content.

40. Since 1989, iron ore production in Liberia has been severely jeopardized by political turbulence, which culminated in a civil war forcing mining and shipments to stop during the second quarter of 1990. As a result, Liberian annual output was less than 4 million tons, compared to 12.3 million tons the year before. LININCO, the mining company which was established to continue operations at the Nimba deposit at an annual rate of 3 million tons until the start of MIFERGUI, produced only 930,000 tons. Bong Mining produced only 3 million tons, i.e. 40 per cent of the planned 7.5 million tons. Mining operations and shipments from last year's stocks resumed in April 1991. Apparently, little damage has been found at the two mining areas of Yekepa and Tokadeh. However, some doubts persist as to whether it will be possible to bring the concentration and pelletizing plants of Bong back to normal operation during 1991.

41. The conflicts in Liberia also had a very negative impact on the development of the MIFERGUI project, which is planned to mine 9 million tons of ore annually from the Mount Nimba deposits in the Southern corner of Guinea, using the Liberian infrastructure for shipments. Investments for this project, which was scheduled to start operations in early 1993, are presently estimated at 220 million dollars. A preliminary environmental assessment study was carried out in 1990 to meet the present financing pre-conditions. However, political unrest in Liberia not only affected the supply capability of Africa, but also increased the political risks in the region, inhibiting new investments. This is adversely affecting the prospects of the MIFERGUI project, particularly during the present phase of project promotion and financing arrangements.

42. Mauritania produced 11.4 million tons in 1990, slightly less than its record of 1989 (12.1 million tons), but still significantly above its previous level of around 9 million tons. Mauritania's increased production over the last two years helped to minimize the effects of production cutbacks in Liberia. Nevertheless, SNIM continues to face great financial difficulties,

mainly due to the low productivity and high financial costs of the Guelbs project. Priority is now given to the development of a new deposit discovered in early 1991, near the existing Tazadit mine, which might start being mined this year, since it only requires an investment of about 10 million dollars for a road 8 km long to link it with the existing Tazadit facilities. In addition, SNIM obtained financing to start developing the 160 million dollar M'haoudat project, scheduled to come on stream in 1993 to produce 6 million tons a year (50 per cent lumps, 50 per cent fines), which will gradually replace the almost exhausted Kedia's deposit. The plans for the pelletizing plant at El Aouj, which was expected to be financed by the Arab Industrial Development Organization (AIDO), were postponed pending an assessment of the impact of the Gulf war on the Middle East demand for pellets.

43. In Senegal, the MIFERSO project may profit from the void left as a result of events in Liberia. Investment requirements have been re-evaluated and specified (mine: 220 million dollars; railway: 435 million dollars; and port: 121 million dollars) with a view to making a distinction between the investments needed for the mining operation itself and for the infrastructure separately, which might facilitate financing from different sources. In addition, the new promotion scheme for the project provides for the privatization of MIFERSO in an attempt to attract foreign investors who have a potential interest in securing intakes from the mining and/or other operations which will be developed under the project. According to the project reassessment made in July 1990, an annual output of 10 million tons (60 per cent lumps and 40 per cent fines) can be mined for 30 years.

44. Iron ore has also been produced mainly for domestic consumption in the main African steel-producing countries namely Algeria, Egypt and Zimbabwe. Nigeria, the Libyan Arab Jamahiriya, Ethiopia, the United Republic of Tanzania and Ghana have plans to develop their deposits in line with the prospects for increased local consumption. Tunisia and Morocco continue to produce marginal quantities. Although iron ore reserves are found almost all over the African continent, exploitation of most of them is economically unfeasible under present market conditions.

Asia

45. Asia accounts for almost 25 per cent of world iron ore output. China is the largest producing country in the region and the second worldwide. However, despite the huge volume of ore extracted in China, nearly 170 million tons in 1990, its poor quality (around 30-35 per cent Fe) resulted in only 59 million tons of iron content being produced. The low grade of the ore explains the growing reliance of the Chinese steel industry on imported ores in recent years. Considering on the one hand the shortage of hard currency which restricts imports, and on the other the huge investments needed to increase domestic production at competitive levels, the Chinese government faces the difficult dilemna of choosing between the expansion of domestic output or a policy of growing reliance on imports. Although China's Eight-Year Economic Plan initiated in early 1991 called for the development of domestic mines, new foreign trade reforms included measures to facilitate imports of raw materials like iron ore and coke to support the growth of the Chinese steel industry. In any case, as the level of crude steel production in China is expected to increase from the current 67 million tons to a target of 85 million tons during the next 10 years, an additional 30 million tons of iron ore might be required by the year 2000.

46. In India, iron ore production in 1990 was maintained at the level of 50 million tons, although production capacity seems to be around 70 million

tons. Iron ore is mined in about 150 small and big mines throughout the country, although the main reserves are located in the States of Bihar and Orissa, Maharashtra, Karnataka and Goa. Concentrate and pellet output from Kudremukh increased to almost 8 million tons last year, and higher output is planned for 1991, including a pellet capacity expansion. The Mandovi pellet plant in Goa, which has been idle for a number of years, is expected to restart operations by July 1991. India's state-owned NMDC is planning to build a third mine financed by Japanese concerns to meet growing demand from local ironmakers, since its other two mines, Bailadila and Donamalai, are heavily committed to the Japanese market. In this regard, the Indian steel industry has been protesting against the exports of high grade ores at a time when domestic demand cannot be met.

47. In the Democratic Peoples' Republic of Korea, iron ore output might have reached 9.5 million tons in 1990 as a result of increased production at the Musan mines and expanded capacity of concentration plants. The Republic of Korea, the third largest iron ore importer country, is virtually devoid of iron ore reserves, and less than 400,000 tons of ore is mined annually. The development of the Thachkec iron deposit in Viet Nam is under consideration; preliminary feasibility studies indicate the existence of high grade magnetite ores and reserves of around 500 million tons.

48. In the Philippines, iron ore mining was discontinued for economic reasons many years ago, but a resumption of operations is not excluded under the objectives of the first primary iron and steel complex presently under discussion. However, the Philippines has the only export-oriented iron ore processing complex which imports iron ore and exports sinter. In Malaysia, Indonesia and Thailand only marginal quantities of iron ore are produced.

Middle East

49. With the commencement of the Gulf crisis during the second half of 1990, the industry of the region was affected either by the trade embargo and/or by the high shipping insurance premiums, which severely affected shipments to and from the region, or even by the fact that plants were damaged or paralysed for lack of inputs or spare parts. In Iraq, where the iron and steel works seem unlikely to have escaped damage during the Gulf war, the output of the direct reduction plants declined from 200,000 tons in 1989 to 170,000 tons in 1990.

50. In Bahrain, the iron ore pellet plant closed in January 1991 when hostilities started, and re-opened in May. In Saudi Arabia, production at the DRI plant declined slightly to 1.1 million tons in 1990. Thanks to ore stocks, DRI production in Qatar and the Libyan Arab Jamahiriya increased in 1990. In the Islamic Republic of Iran it is estimated that 5.5 million tons of iron ore were produced in 1990 to feed the Isfahan iron and steel complex, and the Iranian Government is currently developing the Gol and Gohar iron ore project to mine about 5 million tons of ore when in full production, yielding some 2.75 million tons of concentrates.

Eastern Europe

51. In 1990, the iron ore output of the world's largest producer, the USSR, amounted to 236 million tons. Although this output was 2 per cent lower than the previous year, it still represented almost 25 per cent of total world output. Most of the Soviet ore comes from the Krivoy Rog basin, the Kursh district and the Kola penisula reserves. About 87 per cent of the ore is presently mined through open pit operations, and around 80 per cent of the total is transformed into concentrates. Last year, the volume of concentrates

decreased because the Kamysh-Burunsk plant and the Krivoy Rog central mine were closed, and in addition the capacity utilization of the Azerbaidjan and Novokrivorozhsky mines was reduced.9/ Nevertheless, efforts to modernize and increase the productivity of the Soviet mines continue. Positive results have been obtained with improvements of ore dressing techniques, which makes it possible now to produce high quality concentrates in the USSR.

52. Furthermore, in an effort to better integrate the Soviet economy with the world economy and to improve its international competitiveness in terms of iron content, variety and types of products, handling, delivery conditions, etc, measures were taken in 1990 to facilitate the creation of joint ventures with foreign companies to develop Soviet iron ore resources, in particular in the area of Irkutsk in Siberia, where only 12 per cent of the existing resources are presently mined.10/ Measures to remove market constraints and administrative prohibitions were also adopted with a view to facilitating the operations of Soviet producers and their foreign partners.

53. In Romania, in the light of the drastic drop of more than 30 per cent in crude steel production, mainly due to energy problems and lack of finance to import iron ore and coal, iron ore output in 1990 dropped sharply to less than 600,000 tons. This in any case represents only a small proportion of the country's total requirements, which in recent years amounted to about 15 million tons. The Czechoslovakia has a limited mineral resource base and its iron ore output remains at the level of 1.7 million tons. In Bulgaria, due to the 25 per cent drop in raw steel output, iron ore production declined to about 1 million tons. Poland and Hungary are totally dependent on iron ore imports.

Rest of Europe

54. In 1990, only 11.9 million tons of iron ore were produced in the countries of the EEC, further evidence of the long-term declining trend in this region. France, where only three mines remained in operation, continues to be the main producing country in the region, with an output of 8.7 million tons in 1990. In Spain, iron ore mining and in particular shipments were affected during the first half of the year because a strong storm damaged the facilities of Cia. Andaluza de Minas, and annual output was 3 million tons compared to 4.6 millions the year before. Marginal quantities are still mined in Germany and the United Kingdom, but together they amount to less than 140,000 tons.

55. Countries of the EFTA region produced 24 million tons of iron ore in 1990, 2 million tons less than the previous year. In Sweden, the main European producer and supplier of iron ore, the annual output declined from 21.8 million tons in 1989 to nearly 19.9 in 1990. LKAB mined 19 million tons, including nearly 10 million tons of pellets from the Kiruna and Malmberget mines, although the output of the latter (with an annual capacity of 6.5 millions tons) was affected by a fire which provoked a slow-down in operations from October 1990 to April 1991. Under the restructuring programme of the Swedish iron ore industry, the Dannemora mine operated by SSAB might be closed at the end of 1991. Austria produced 2.3 million tons of low-grade ore (33 per cent Fe) in 1990 for domestic consumption, and is planning to produce 3.2 millions in 1991 thanks to modern equipment currently being used by Voest Alpine. Norway produced a little more than 2 million tons of concentrates in 1990. Following a major reorganization, the iron ore mining division of Norsk Jernsverk might move into more specialised products in the near future. Finland and Switzerland do not produce iron ore.

56. In Yugoslavia, strikes at the Zemica iron ore mines resulted in a lower

annual output of 4.1 million tons. In Turkey, the operations at the Divrigi mine returned to normal in 1990, which helped to increase total output by more than 2 million tons, reaching a record level of 6.1 million tons.

Latin America

57. Latin America maintained its top world supplier position. In 1990, 195 million tons of iron ore were produced in the region, accounting for 20 per cent of world output. The leading position of Brazil as the world's largest iron ore supplier has been strengthened, as a new production record of 154.4 million tons was reached, of which 114.3 million tons were exported. The CVRD System, which includes Cia. Vale do Rio Doce and its pellet joint ventures, produced 114.5 million tons, including 15.8 million tons of pellets. Despite a major strike in September, the Carajas project reached its full capacity of 35 million tons in 1990, and output from CVRD's Southern mines remained stable. However, to maintain its international competitiveness and its present supply capability, CVRD is undergoing a stringent cost-cutting programme, and investments have recently been restricted to equipment and quality improvements.

58. Brazil's second largest iron ore miner, Mineraçoes Brasileiras Reunidas (MBR), maintained its output at 20 million tons, but exports further increased, reaching 17.2 million tons in 1990, or 15 per cent of the Brazilian total. MBR operates three mines and has invested over the last few years to improve its transportation links. Plans to gradually expand output may materialize, if adequate returns on investments can be achieved. Among the Brazilian top five iron ore companies, Ferteco produced 10.3 million tons of ore and 3.5 million tons of pellets; Samitri's output for the first time also exceeded 10 million tons, and Samarco mined more than 8 million tons of ore from its Germano mine, of which 5.3 millions were pelletized. Samarco is investing to improve product quality and to develop the Alegria mine, which will gradually replace the deposits presently in operation.

59. Venezuela produced 20.1 million tons of iron ore in 1990, 2 million tons more than the year before. CVG Ferrominera has been expanding output from its San Isidro, Cierro Bolivar, and El Pao mines, but in the light of the growing domestic demand for the DRI plants, measures to further expand production capacity are being considered with a view to maintaining the country's export capacity. In early 1991 a final decision was taken to build, in association with Kobe Steel from Japan, a new pelletizing plant on the Orinoco River basin to produce 3.3 million tons of pellets annually from 1993 onwards. This will bring the total iron ore mine capacity of Venezuela to 25 million tons by 1993.

60. In Chile total iron ore output declined from 8.1 to 7.8 million tons in 1990. The two major mines, Algarrollo and Romeral, are operated by Compañia Minera del Pacifico (CMP). Four million tons of pellets were produced last year at the Huasco plant. In addition to the wide range of Chilean products, which includes self-fluxing and DR pellets, pellet chips, pellet feed and sinter fines, a new brand of pellet feed came to the market at the end of 1990, as the new Romeral pellet-feed plant, with an annual capacity of 1.2 million tons, came on stream.

61. In Mexico 8.1 million tons of concentrates were mined in 1990 to meet domestic demand. With 9.5 million tons of pelletizing capacity, about 8.3 million tons of pellets were produced last year, and output is planned to increase further. With a view to avoiding iron ore shortages and/or capacity under-utilization, the Mexican integrated iron and steel works are considering different alternatives for an Iron Ore Programme to be implemented during this decade.

62. In Peru iron ore output further decreased to 3.3 million tons, including only 1.3 million tons of pellets. 1990 was the worst year for the Marcona operations of Hierro Peru. Although Peruvian mines and plants have an installed production capacity of more than 7 million tons, equipment is obsolete, productivity is low and operating costs are too high. In early 1991, Hierro Peru announced its new strategic objectives to overcome its present difficulties, which include privatization, a technical and administrative restructuring programme aiming at higher efficiency, rehabilitation of infrastructure and reduction of operating costs.11/

63. Bolivia produced 125,000 tons of ore at its Mutun mine in 1990. The Bolivian Government is inviting national and foreign private companies to explore the Mutun deposits, which are located near the Brazilian border, with easy access to both rail and river transport, and are close to an industrial free zone port.

North America

64. Iron ore output in North America declined by 8 per cent in 1990 to 91 million tons. The restructuring of the iron ore industry in the region continues, and the remaining high-cost mines may close down. The level of iron ore consumption in 1990 was, however, considered satisfactory: 85 million tons, of which about 85 per cent consisted of pellets. At present, 13 pellet plants are operating in North America and 77 million tons of pellets were produced last year.12/ In the United States 55 million tons of iron ore were produced in 1990, and nearly all of it was concentrated and pelletized, as it was mainly low-grade (35 per cent Fe). The output of Cleaveland Cliffs, the major iron ore company in North America, was affected last year by a four-month strike at its Empire and Tilden mines in Michigan. The output of these mines may be cut in 1991, unless steel demand improves.

65. In Canada the drop in iron ore output was more accentuated. Canadian production was 35.8 million tons, 13 per cent lower than in 1989. This decline was mainly attributable to the permanent closure of two mines (bringing the number of operating mines in Canada to four) and to several strikes. The output of Quebec Cartier Mining (QCM) declined to 14.5 million tons, although the life of its Mt. Wright mine has been extended by 10 years. The annual production of Iron Ore Company of Canada (IOC) also decreased to 14.2 million tons due to temporary closures of some of its pellet plants. Operations at Wabush Mines and Algona Ore were affected by strikes, and the two mines in Ontario, Adams and Sherman, closed down definitively in March 1990.13/

Oceania

66. In Australia iron ore production further increased in 1990 reaching its highest level of 112 million tons, consisting of 67 million tons of fines, 42 million tons of lumps, and 3 million tons of pellet feed. Australian exports declined last year, although they accounted for nearly one third of world iron ore seaborne trade. Motivated by the high level of iron ore demand over the last three years, a major programme of new mine development is under way in this country. Hamersley Iron, the largest iron mine company, which has been operating for 25 years, has at present an annual production rate of 46 million tons, although shipments in 1990 were only 41 million tons due to strikes. Its newly developed Channar project, designed for the Chinese market, produced slightly more than 3 million tons last year and might reach 5 million tons in 1991. Hamersley is now planning the development of the Marandoo deposits which are expected to come on stream by 1994, initially at an annual rate of 5

million moving up to a full production level of 10 million tons; this would make it possible to extend the life of the Tom Price mine, which might run out within 10 years. Alternatively the development of the Brockman No. 2 project would require about 50 million dollars investment, and construction could start in 1991 and be completed in 1992, with an annual production of about 3-5 million tons.

67. The BHP Group consolidated its position in the Australian iron ore industry, since as from 1990, in addition to Mount Newman, BHP Iron Ore also operates the Goldsworthy and the Yandicoogina joint ventures. Since 1989 Mount Newman output has been affected by a major pit wall collapse at its Mt. Whaleback mines, but in 1991 the annual rate of 22 million tons was restored. The Goldsworthy operations are presently mining 6.6 million tons annually. The Yandicoogina project is being developed and is expected to commence operations in 1992 at an annual rate of 5 million tons using Mt. Newman's transport facilities. Total output from BHP operations is expected to be near 50 million tons in 1992.14/ The other major iron ore miner, Robe River, is also investing in expansion, with plans to reach 30 million tons capacity a year by 1992; Robe River's Pannawarica mine produced 26 million tons in 1990.

68. New Zealand produced 1.3 million tons of iron sand from its Tahara mine, practically all exported to Japan.

C. Financing and Investments

69. Strong demand, the reduction in existing world mining capacity, and the trend towards greater stability encouraged attitudes favourable to investment in iron ore mining operations in 1989-1990. However, the Gulf events and the consequent short-lived but strong oil shock inhibited mining investment decisions worldwide during the second half of 1990. On the other hand, the transition of Eastern European countries from centrally planned to market economies, the era of liberalisation and privatization in a number of developing countries, and the recent economic reforms under way in China - all these factors increased the attractiveness of the creation of foreign joint ventures aiming not only at achieving economic benefits, but also at sharing financial and investment risks. Most of the countries concerned are reviewing their investment codes, their mining legislation, and their foreign exchange and credit mechanisms, as well as removing market constraints in order to attract potential foreign partners. The competition among developing countries and Eastern European countries for joint venture partners intensified in 1990-1991.

70. Investors, however, seem to be cautious. Despite the improvement of iron ore prices over the last two years, their current level is not yet sufficiently attractive to justify sizeable amounts of costly investments. A number of iron ore companies which, in recent years, have invested in modernization, improvement of product quality and capacity replacement have been facing serious financial difficulties in connection with the servicing of their loans, mainly because high interest rates have made the debt service/company turnover ratio extremely heavy, preventing satisfactory rates of return.15/ In addition, in order just to maintain the current production levels of many iron ore operations, large investments have been required for the acquisition of modern mining equipment, the introduction of automation, the adoption of cleaner technologies and adequate management of mining wastes, as well as the implementation of more stringent environmental and industrial hazard controls.

71. Thus, even if the market upturn in 1989-1990 improved the economic viability of a number of projects, some caution seems to be required in view of the following considerations:

a) If all the envisaged projects were to be implemented at the same time, another period of over-supply and depressed prices would be inevitable. Annexes I and II show that planned capacity expansions are much higher than effective closures and mining capacity reductions;

b) In the mining sector throughout the world, numerous projects are competing fiercely in order to attract private investors and to receive financial assistance from multilateral institutions;

c) Given the fact that in a great majority of developing countries total financial outflows exceed capital inflows, the development of any new project requires a very careful cost-benefit analysis in order to avoid further negative transfers of resources.

72. In 1990 the World Bank/IDA (International Development Association) approved a loan for the Mauritanian iron ore producer, SNIM, to help service its mounting debt problems resulting from loans contracted for the development of the Guelbs Project. For 1991, the Bank is considering financing assistance for the MIFERGUI project in Guinea, but two major concerns are affecting the rapid progress of financing negotiations: the political situation in Liberia, from where the ore will be shipped, and the likely environmental impact around the mining area. In 1990 the European Economic Community did not decide on any financing for iron ore projects. In general, although the number of potential projects increased, investment plans have been revised downward.

Table 8

Investment plans for iron ore, 1990-1991

Region	Number of projects		Investments ($US million)	
	1990	1991	1990	1991
Africa	3	4	1260	1166
Asia	1*	1*	128	128
Western Europe	-	-	-	-
North & Central America	3	4	414	434
South America & Caribbean	4	4	391	338
Oceania	4	4	695	625
Total	15	17	2,888	2,691

Source: UNCTAD secretariat. * Relates to several small projects in China.

See also: Annex I - Iron ore mining projects: new mines and capacity expansion.
Annex II - Iron ore mining projects: closures and capacity reduction.

IV. TRADE IN IRON ORE

73. International trade in iron ore totalled 396 million tons in 1990, 6 per cent below the all-time record of 1989. The volume of ore traded in the world market accounted for 40 per cent of world iron ore output. Major trade flows continued to be influenced, on the export side, by the dominant position of Brazil and Australia which together accounted for more than 50 per cent of world exports, and, on the import side, by the dominant position of Japan and Germany, which together represented more than 40 per cent of world imports. Among the importing countries, the Republic of Korea occupied the third rank for the second consecutive year, and China increased its share. On the exporting side, Liberia was replaced by Chile among the 10 principal exporting countries, while South Africa experienced the strongest market share increase in 1990. The Soviet Union's efforts to increase its market share and expand its export outlets have not yet succeeded due to the lower level of output.

Table 9

Major iron ore trade partners in 1990

	Major exporters	Share (%) of world exports		Major importers	Share (%) of world imports
1.	Brazil	28.8	1.	Japan	31.8
2.	Australia	24.3	2.	Germany, Fed. Rep. of*	11.1
3.	USSR	9.2	3.	Republic of Korea	5.7
4.	India	8.6	4.	Belgium/Luxembourg	5.1
5.	Canada	6.8	5.	France	4.8
6.	South Africa	4.3	6.	United Kingdom	4.5
7.	Sweden	4.1	7.	Italy	4.4
8.	Venezuela	3.4	8.	China	3.6
9.	Mauritania	2.9	9.	Romania	2.9
10.	Chile	1.7	10.	Poland	2.8

Source: UNCTAD secretariat
* Prior to unification

74. The total value of world iron ore exports reached the record level of 8.75 billion US dollars in 1990, more than 500 million US dollars above 1989. The lower volume of exports was more than offset by higher prices. However, fluctuations in the exchange rates of the US dollar (the currency used for iron ore trade transactions), in particular vis-à-vis the national currencies of exporting countries, have had a strong impact on the profitability of individual companies. The evolution of iron ore exports from the 10 major exporting countries is shown in table 10 below.

Table 10

Major iron ore exporting countries, 1981-1990
(million tons)

Country	1981	1983	1986	1989	1990	1990/89 Change (%)
1. Brazil	90.0	70.0	92.3	111.6	114.3	2.4
2. Australia	71.1	74.0	79.7	104.5	96.2	-8.0
3. USSR	44.1	42.8	46.2	39.9	36.3	-9.0
4. India	22.4	20.7	28.1	33.5	34.0	1.6
5. Canada	41.4	24.8	31.0	30.2	27.0	-10.5
6. Sweden	17.7	14.2	17.1	17.5	16.4	-5.9
7. South Africa	13.7	7.8	8.8	14.5	17.0	16.9
8. Venezuela	12.4	6.2	10.0	14.4	13.6	-5.7
9. Mauritania	8.9	7.4	8.9	11.1	11.4	2.0
10. Liberia	20.7	15.7	13.9	12.7	3.9	-69.5
World total	370.2	313.6	364.4	420.3	396.4	-5.7

Source: UNCTAD secretariat -"Iron Ore Statistics, 1981-1990".

75. Undoubtedly, the key market for iron ore remains Japan. In addition, the growing importance of the Republic of Korea, China and other fast-growing countries in the region is contributing to strengthening the attractiveness of Asia and the Pacific route for iron ore trade. In 1990, the expansion of the Japanese economy continued despite oil supply turbulence, since its dependence on crude oil imports was only half of what it had been in the 1970s. Consequently, Japanese imports of iron ore in 1990 declined by less than 2 per cent from the record level of 1989, and exceeded 125 million tons (see table 11). For the Japanese market, fines remain the iron ore product most in demand. This trend was accentuated last year due to increasing productivity and expanding sintering capacity. Demand for lump ore, which was strong in 1989, declined in 1990, probably because the level of the lump ore premium was higher than ever.

Table 11

Iron ore imports into Japan - 1989-1990
(million tons - round figures)

Origin	Non-agglomerated		Agglomerated		Import share (%)	
	1989	1990	1989	1990	1989	1990
Australia	54.6	52.2	1.7	1.7	44.1	43.0
Brazil	25.8	26.2	3.7	4.0	23.1	24.1
India	21.1	20.7	0.2	-	16.6	16.6
Philippines[1/]	-	-	4.5	4.8	3.5	3.9
South Africa	4.8	4.8	-	-	3.8	3.8
Chile	2.9	2.3	1.8	1.7	3.6	3.2
Canada	2.1	1.9	-	-	1.7	1.5
Venezuela	0.5	1.8	-	-	0.4	1.4
New Zealand[2/]	1.4	1.3	-	-	1.1	1.0
Peru	0.6	0.4	0.4	0.5	0.8	0.7
Sweden	0.7	0.4	0.1	0.2	0.6	0.5
Mauritania	0.4	0.2	-	-	0.3	0.2
Others	0.4	0.2	-	-	0.4	0.2
Total	115.4	112.4	12.3	12.9	100	100

Source: UNCTAD secretariat - Iron Ore Statistics, 1981-1990

1/ Sintered ore.
2/ Iron sand.

76. In 1990, iron ore imports into the EEC (excluding the EEC's internal trade) stood at 124.3 million tons, i.e. about 12 million tons below their 1989 level. With the exception of Belgium/Luxembourg and the Netherlands, declines occured in all EEC member countries. In Germany (the Federal Republic of Germany prior to unification), imports in 1990 were 43.7 million tons compared to 47.2 million tons the year before; this downward trend might continue in 1991, since Germany's total crude steel output may further decline due to growing imports of steel products and to the reduction in steel production in the Eastern part of the country. The breakdown of iron ore imports into the EEC by origin is shown in table 12 below.

Table 12

EEC's iron ore imports by origin/destination - 1990
(million tons, natural weight)

Origin \ Destin.	Germany	France	Italy	Neth.	Bel/Lux.	U.K.	Spain	Port.	EEC
Non-agglomerated									
Total	27.8	18.4	14.5	8.3	19.7	15.5	4.4	0.3	104.3[a/]
of which:									
EEC	-	0.2	-	0.4	3.5	0.4	-	-	-
Australia	5.3	4.3	1.6	1.4	1.5	4.7	0.7	-	19.5
Brazil	13.4	6.2	4.8	2.4	6.4	3.4	1.6	-	38.4
Canada	3.7	1.6	0.5	0.8	0.6	1.7	0.2	0.1	9.3
Liberia	1.6	0.5	0.7	-	0.1	-	0.2	-	3.2
Mauritania	0.1	2.3	2.3	-	2.5	1.2	0.8	-	9.5
Norway	-	0.6	-	1.5	0.2	-	-	-	2.5
South Africa	1.1	0.8	1.6	0.6	0.1	2.6	-	-	6.8
Sweden	1.8	0.4	-	-	2.9	0.1	-	-	5.2
Venezuela	0.7	1.0	1.0	0.4	1.5	1.2	0.8	-	6.6
Agglomerated									
Total	15.9	0.4	2.7	-	0.5	2.1	2.3	0.2	24.0[a/]
of which:									
EEC	0.1	-	-	-	0.1	-	-	-	0.2
Australia	-	-	-	-	-	-	-	-	-
Brazil	6.2	-	1.6	-	-	-	1.9	-	9.7
Canada	2.3	0.2	0.6	-	-	1.4	0.3	0.2	5.1
Liberia	1.5	-	0.4	-	-	-	-	-	1.9
Norway	0.4	-	-	-	0.3	0.7	-	-	1.5
Sweden	3.9	-	-	-	-	-	-	-	3.9
Venezuela	-	-	-0.1	-	-	-	-	-	0.1
Total (including others)	43.7	18.8	17.2	8.3	20.3	17.6	6.7	0.5	128.2[a/]

Source: - EUROSTAT and UNCTAD
Note: Ireland, Greece and Denmark - no or marginal imports.
a/ Third countries only

77. In Eastern Europe, a further decline in 1990 accentuated the downward trend in the level of consumption and imports of iron ore already observed in 1989. This resulted not only from the drastic decline of crude steel production in these countries, but also from the shortage of hard currency for international trade operations. The USSR remains the major supplier to this region, as shown in table 13.

Table 13

Eastern European iron ore imports by origin/destination, 1990
(million tons, round figures)

Destin. / Origin	Poland	Romania (E)	Czecholovakia (E)	German* Dem. Rep. (E)	Hungary	Bulgaria
USSR	10.0	7.3	6.9	1.6	2.7	2.0
Brazil	0.4	0.9	1.2	0.2	-	-
Norway	-	-	0.1	-	-	
Sweden	0.2	-	0.1	0.3	-	-
India	-	2.7	0.2	0.7	-	-
Venezuela	0.3	-	0.2	-	-	-
Others	-	0.4	-	-	0.2	-
Total	11.0	11.3	8.7	2.8	2.9	2.0

Source: UNCTAD secretariat - "Iron Ore Statistics 1981-1990".

* Prior to unification.
(E) = Estimate.

78. Iron ore seaborne trade in 1990 was 10 million tons lower than in 1989, but was at the same level as in 1988, at 355 million tons. Only Brazil and South Africa increased shipments in 1990. Declines occurred in West Africa because Liberian shipments ceased last June. Australia and India both had delays in shipment schedules due to strikes and technical problems. Iron ore shipments to the United States declined, mostly because of higher consumption of domestic ores, while other developments reflected the overall market situation.

Table 14

World seaborne iron ore trade, 1981-1990
(million tons)

Years:	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990a/
Origin										
Scandinavia	18	15	17	21	21	21	19	20	19	19
West Africa	27	23	24	27	25	23	25	27	23	18
South Africa	13	12	9	11	10	8	9	12	14	17
Brazil	79	74	69	88	92	92	101	106	108	114
India	24	24	22	24	29	32	30	32	34	32
Australia	75	72	75	85	88	80	87	100	108	101
Other origins	67	54	45	47	47	54	50	58	59	54
WORLD TOTAL	303	274	261	303	312	310	321	355	365	355
Destinations										
West Europe	112	97	90	104	119	114	125	144	140	141
East Europe	18	11	14	20	16	14	15	14	14	13
United States	19	9	7	12	7	13	13	16	16	12
Japan	123	122	109	125	125	115	112	123	128	123
Other destinations	31	35	41	42	45	54	56	58	67	64
WORLD TOTAL	303	274	261	303	312	310	321	355	365	355

Source: Drewry Shipping Consultants Ltd.
(a) Preliminary.

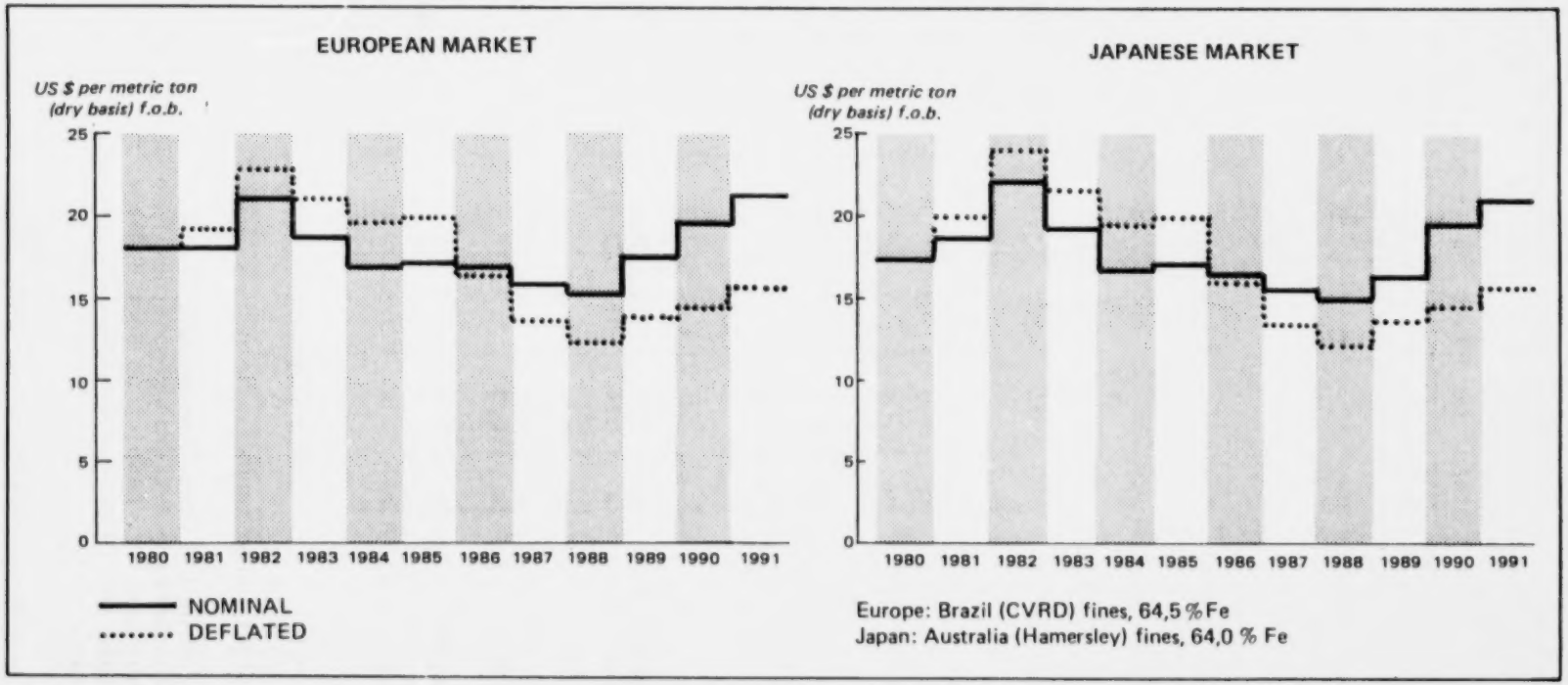
V. IRON ORE PRICES

79. Reflecting a close balance between market forces and the awareness that the long-standing trend of over-supply and downward pressure on prices had been reversed, price negotiations for 1990 ended with increases of nearly 16 per cent for the reference grade of iron ore fines. The major iron ore exporting company, CVRD from Brazil, re-assumed its position as price leader. Following the tradition, prices were first settled in the European market and aligned according to quality specifications within the range of 16-22 per cent for fines and lumps and 7-10 per cent for pellets. Prices of relatively the same level were applied in the Japanese market. However, despite the cumulative increase of 31 per cent during the 1989-1990 period, 1990 FOB prices of CVRD fine ore for Europe were, in nominal terms, still 5.2 per cent below their level of 1982 ($US 20,96/ton in 1982 against $US 19,87/ton in 1990) and, in real terms, far below the level prevailing during the first half of the 1980s, as shown in chart 3.

80. Throughout 1990 a number of events provided further evidence of the vulnerability of world supplies of iron ore. Indeed, despite the signs of softening demand and all the uncertainties surrounding the Gulf war and its possible adverse effects on the world economy, the position of iron ore sellers remained strong, and price negotiations for 1991 resulted in further improvements. The first price settlement was reached for the Japanese market at the end of January 1991 between Australia's Hamersley and Nippon Steel, defining the benchmark of a nearly 8 per cent increase for fines and a nearly 6 per cent increase for lumps. This level was also agreed upon the following day for the European market where this year, Sollac, representing the French consumers, took a very active role in setting iron prices. However, there were great divergences about pellet prices and, after intense negotiations, by May most suppliers finally agreed on a marginal price increase of less than 1 per cent.

81. The most controversial issue about price negotiations in recent years has related to the level and representativeness of the freight rates on the basis of which prices of iron ore have been set. In addition, the system of freight sharing applied for the Japanese market has seemed to penalize long-distance suppliers, 16/, as evidenced by the fact that the price differences between nearby and distant sources have widened further. It should be pointed out that for the second consecutive year, price increases in 1990 were actually half of what iron ore suppliers had initially requested. Accordingly, iron ore producers continued to claim that the current level of prices remained insufficient to ensure a steady supply both in quality and quantity over the long term.17/ Recent price increases have alleviated market tensions, but are not yet considered as fully satisfactory by the producers.

Chart 3
IRON ORE PRICES 1980-1991, NOMINAL AND DEFLATED[a]



Notes: [a] Nominal prices deflated by the United Nations index of unit value of exported manufactured goods (1980 = 100).
For the Japanese market, prices are effective from April/March (fiscal year).
For 1991, deflated index is estimated based on the first quarter of the year.
Price in Japan converted from DLT (dry long ton) to DMT (dry metric ton). Convection factor = 1.016047.

Source: UNCTAD secretariat

VI. TRANSPORT COSTS AND FREIGHT RATES

82. In 1990, despite a decline of about 3 per cent in the seaborne trade of iron ore, this commodity was still leading the dry cargo trade, and transportation costs continued to account for about 20-25 per cent of the iron ore C&F price. To alleviate the impact of transportation costs, the use of large and ultra-large bulk carriers has been increasing every year, in particular for the traditional long-distance iron ore routes such as Brazil/Japan and Australia/Europe. A number of iron ore dispatching and receiving countries continued to modernize their port infrastructure in order to facilitate ship loading and discharging.

Table 15

Freight rates for iron ore in the single-voyage charter market, 1981-1990
($US per DWCT)

Trade routes		1981	1983	1985	1988	1989	1990d/
Eastern Canada-Europe a/ (110-130,000 DWCT FIO)	H	7.2	3.5	5.0	6.7	8.8	8.3
	L	3.3	3.0	2.4	5.0	5.7	3.9
	A	4.7	3.3	3.6	5.6	7.1	5.6
Liberia-Europe a/ (60-80,000 DWCT FIO)	H	7.9	4.7	5.2	7.8	8.7	7.9
	L	4.9	3.6	3.2	5.0	5.8	5.3
	A	5.9	4.2	4.2	6.3	6.9	6.5
Brazil-Europe a/ (80-100,000 DWCT FIO) (120-160,000 DWCT FIO) c/	H	10.3	5.9	6.8	7.5	8.8	8.0
	L	6.7	4.5	4.0	5.8	6.8	5.2
	A	8.4	5.1	5.7	6.8	7.5	6.7
Brazil-Japan (90-110,000 DWCT FIO) (125-155,000 DWCT FIO) c/	H	12.3	8.9	9.0	2.3	15.5	15.2
	L	8.9	7.5	7.5	8.8	12.2	10.3
	A	10.3	8.2	8.0	10.4	13.7	12.6
Western Australia b/-Europe a/ (120-140,000 DWCT FIO)	H	12.9	10.8	9.0	9.4	11.5	10.7
	L	7.8	6.0	5.7	6.9	8.7	7.7
	A	9.8	7.6	7.3	8.5	9.6	9.4

H = Highest month L = Lowest month A = Average of 12 months
FIO = free in and out
DWCT = Dead weight cargo tonne

Source: Drewry Shipping Consultants Ltd.
a/ Discharge Antwerp-Rotterdam-Amsterdam (ARA) range of ports.
b/ Load Cape Lambert, Dampier or Port Hedland.
c/ 1988, 1989 and 1990.
d/ Estimate.

83. The freight market remained strong in 1990 and was strongly influenced by the events of the Gulf. During the first half of the year, the bulk market was in oversupply and freight rates were subject to downward pressure because the seaborne market was influenced by the low rates and lower level of oil trade. Thereafter, from early August onwards, the market became very active and an upward movement occurred due to scarcer vessels, escalating insurance premiums, and large military movements in the Middle East. Even before the eruption of the Gulf war, there was great competition for vessels chartered on a spot basis, and the strong confrontation between shippers and traders led to peak rates in October/November 1990, just at the time when iron ore price negotiations for 1991 started. During the first half of 1991, there was still no sign of softening of ocean freightage rates for all categories. However, rates were expected to stabilise during the second semester of the year. Shipping arrangements for iron ore are more and more negotiated under long-term affreightment contracts.

VII. TECHNOLOGICAL AND ENVIRONMENTAL ISSUES

84. Recent technological developments and the growing concerns about the protection of the environment in the mining industry are likely to influence the future pattern of iron ore production, consumption, and trade. An attempt has, therefore, been made to briefly identify major issues in these areas and highlight the main implications for producers and consumers of iron ore.

A. Technical and technological advances

85. As a result of massive investments in R&D and intensive research work, many advances occurred in the course of the 1980s in the field of iron ore and iron. The great challenge of the iron ore industry was to find the most cost-effective ways of complying not only with the quantity requirements but above all with the more and more strict quality requirements of iron ore consumers. Firstly, the wide adoption of improved beneficiation techniques and concentration processes made possible the upgrading of a large volume of low-grade ores, which resulted in a increase in the world average Fe content of ores. Furthermore, greater attention has been given to the quality parameters of ore, in particular as regards the chemical composition, physical and reduction characteristics, granulometry, consistency, etc. Improved techniques made it possible to reduce the content of impurities such as metalloides, alkaline oxides and other elements detrimental to the quality of iron and steel products.[18/] Recently, important achievements have also been seen with regard to dephosphorization, since research on phosphorous removal from iron ores has also given good results.[19/]

86. The greater availability of fines ore, unsuitable as such to feed blast furnaces, has contributed to the improvement of sintering and pelletization processes. In the particular case of pellets, which, with a few exceptions, are produced by the iron ore mining industry, great efforts have been made to reduce costs and improve quality. The major advance in pelletizing has been the switch from the traditional acid pellets to fluxed pellets, thanks to the utilization of organic binders and the use of limestone and dolomite. By the end of the 1980s, a growing number of plants had turned to olivine fluxed pellets, a product which has mechanical and metallurgical properties comparable to good quality sinter.[20/] In addition, in view of the greater acceptance of direct reduction technology which led to the search for an optimum iron oxide feed mix for the DRI plants, many pellet producers have diversified their product range and are now also producing oxide pellets for directly reduced iron.

87. In the field of ironmaking, the evolution of steelmaking made possible great flexibility in the choice and combination of ferrous metallics. This led to intense competition between the three basic metallics, namely pig iron, sponge iron or DRI and ferrous scrap, resulting in improved technologies and alternative processes for ironmaking.

88. Depending on the process, primary iron is produced in either of the two forms: as pig iron, generally as liquid hot metal, or as solid directly reduced sponge iron. Pig iron production through the classical blast furnace route remains the most used process. Although there has been no radical change in this conventional ironmaking process, a number of improvements now allow for higher productivity and more economic use of ferrous-bearing materials.21/ At present, there are different practices relating to blast-furnace operations which make it possible to have various combinations of different high quality agglomerated burdens. In addition, efforts are being made to develop blast furnaces able to utilise 100 per cent oxygen with a view to reducing investment and production costs, as well as producing smaller quantities of iron more economically.22/

89. For sponge iron production, the direct reduction process, although not a new technology, gained impetus during the 1980s. In this ironmaking route, metallic iron is produced by reducing iron oxide materials without fusion. Technological advances in DRI have led to a more efficient use of the iron charge and more efficient safeguards against re-oxidation during storage and transportation. The most frequently used gas-based direct reduction process needs high quality pellets or lumps to feed its shaft furnaces (MIDREX, HYL III), while in fluid bed (FIOR) processes ore fines are used. The rotary kiln processes prefer the use of lumps. So-called HBI (hot briquetted iron) is an enhanced form of direct reduced iron specifically designed for ease of handling, charging and melting. It can be used in combination with scrap or as a scrap substitute in modern meltshops. Compared to non-briquetted directly reduced iron, HBI has a superior physical structure and can also be used as a foundry charge material and as a molten metal collant in all types of ferrous melting operations.23/

90. More recently, in a search for alternative processes for ironmaking, advanced technologies for new smelting reduction are being developed. In this regard, attention should be drawn to the distinction between SR (smelting reduction) and DR (direct reduction) processes; the first produces liquid metal while DR produces cold solid metal. In spite of the fact that these processes are based on different types of reactors, the common feature is that they are based on coal instead of coke, except in the case of the plasmasmelt process which sometimes requires a limited amount of coke. It is noteworthy that the non-use of coke ovens for the production of hot metal considerably reduces the level of pollution, because it avoids sulphur dioxide emissions. Among these new smelting reduction processes, the COREX is the most advanced, and the first industrial plant using this process started operations in South Africa in 1990.24/ This process was developed for producing liquid iron while bypassing the cokemaking step, which reduces costs, requires lower capital expenditures and alleviates the environmental burden. A major advantage of the COREX technology is that a wide range of low-grade coals can be used. This method can therefore be applied in countries where coking coal is not indigenous (only approximately 12 per cent of the world coal reserves are coking coals).

91. Another promising alternative presently being investigated for producing iron units is iron carbide. This technology has been patented and limited quantities have been produced and tested over the past 10 years. At present

studies are being carried out in the United States to define the technical and economic feasibility of producing iron carbide commercially. In this technology, iron oxide is reduced by hydrogen and carbonised by the carbonaceous gases to form iron carbide at low operating and capital costs.25/

92. In terms of demand for different types of ores, requirements differ from one process to another. Processes relying on shaft furnaces to preheat and prereduce ores need sized ores, i.e. lumps, pellets or sinters. Processes in which preheating and prereduction of ores are done in fluid beds, circulating beds or flash reactors accept fines or concentrates.26/

B. Environmental concerns

93. In view of the greater awareness regarding activities aggressive to the environment, the mining industry in general and the iron ore industry in particular have been more conscious about the effects of the rapid depletion of natural resources and also more attentive to pollution control activities. Efforts have been made to implement monitoring programmes and measures more compatible with environmentally sound mining activities. However, given the low level of iron ore prices, and the consequent reduced exports earnings of producing countries, it has been extremely difficult, in particular for developing countries, to absorb the financial costs needed for pollution control activities, research on new environment-friendly technologies, and the implementation of remedial measures where damage already exists.

94. From the starting point of ore extraction and agglomeration, to the intermediary primary iron industry, the secondary metal recycling industry and the final steelworks, the whole iron ore/sinter/pig iron/scrap/steel sector has been called upon to monitor the parameters relating to air, water, soils, noise and aesthetic pollution in accordance with the current stricter environmental legislation.

95. At present, mining activities require preservation programmes in which the rational utilization of soil, subsoil, atmosphere and water is imperative. Furthermore, in order to prevent environmental damage, mining wastes must be avoided and land rehabilitation in these areas effective. In the case of iron ore, the environmental impact of ore extraction depends on a number of factors: the method used in mining operations; the surface of the mining area; the physical and chemical characteristics of the ore body; the depth of the soil layers and rocks; the consequent morphological and topography changes in the area; and finally, the primitive environment in which the deposits are located.

96. The current methods used for ore dressing, concentration and agglomeration also have to comply with more strict controls against air and water pollution, mainly due to the harmful residues in the dust originating from the various processing stages. A number of sinter plants have been closed in recent years for not complying with environmental standards, in particular as regards airborne emissions. Modern equipment, adequate technologies, and rehabilitation programmes can help to minimize ecological damage and reconcile ecological, economic and social development. It should be recalled that an environmental impact assessment has become a sine qua non for the financing of any new iron ore project.

97. A major polemic in the late 1980s related to the impact on the environment of the processes used for producing pig iron. The use of charcoal

instead of coke in blast furnaces became a controversial question because of its deforestation effects. This practice, after disappearing in industrialized countries with temperate climate areas, became an attractive alternative for developing countries which have limited resources of coking coal and are located in wet equatorial and tropical areas, where reforestation is possible.

98. On the other hand, the classical route for pig iron production based on coke and sintering plants also has enormous pollution constraints, mainly due to the emissions from coke ovens, in particular of SO_2 (sulphur dioxide) responsible for acid rain, and CO_2 (carbon dioxide) which, although non-toxic, contributes greatly to the so-called greenhouse effect. As a result of growing constraints on the traditional methods for iron-making, whether using charcoal or coke, the search for cleaner technologies more compatible with new environmental regulations has been intensified. Today, there is greater acceptance of gas-based direct reduction methods making direct use of virgin iron ore without melting. Efforts are also being made to develop new smelting reduction processes based on coal instead of coke (like the COREX and iron carbide processes mentioned in paragraphs 90 and 91 above).

99. The secondary metals industry in general and the ferrous scrap industry in particular are also facing pollution regulatory controls despite the fact that their contribution to environmental protection is generally recognized. The major advantage of recycling is that it consumes less materials and energy than primary production. It is estimated that about 35-40 per cent of world steel production depends on scrap as a basic material.[27/]

100. The most sensitive issue as regards the scrap industry relates to the concept of waste and its linkage with what can be considered as "hazardous waste" under the current tighter environmental legislation, which advocates greater control over industrial emissions and over transboundary movements of hazardous waste and their disposal.[28/] While on the one hand the development of the scrap metal industry, by considerably reducing energy requirements, leads to a decrease in pollution levels, on the other hand it contributes to increasing pollution, since the recycling of steel products containing alloying materials (chromium, nickel and molybdenum) and coating materials (tin and zinc) results in toxic emissions.[29/]

101. For the steel industry itself, with the exception of benzene, an extremely hazardous chemical, most waste products apparently do not have high toxic contents, and it seems that the bulk of pollutants is made up of solid particles that require relatively simple control processes. According to some experts, the major problem facing steel mills in complying with current environment regulations is not technological, but purely economic.[30/] It should be noted, however, that the integrated blast-furnace steel producers are not the only ones who have to meet strict regulations in order to comply with the new standards for emissions; the electric-arc furnace mini-mills are also facing problems with the harmful substances such as chromium, lead, zinc, manganese, cadmium and zinc contained in the furnace dust.[31/]

102. From the above it is clear that both iron ore producers and consumers feel committed to the protection of the environment. Closer co-operation and regular exchanges of information on technological and environmental issues can therefore be of mutual benefit to all those involved in iron ore mining, as well as in the iron and steel industry.

VIII. SHORT-TERM OUTLOOK FOR IRON ORE

103. With regard to 1991 as a whole, as world economic growth is slowing down and steel-using industries are consequently being hit, it already seems clear that the iron ore boom years of 1989/1990 are over. In developed market-economy countries, the major iron ore consumers, the steel market is declining. According to the OECD, lower rates of GNP growth (2.0 per cent in 1991 compared to 2.8 per cent in 1990), higher rates of interest and inflation, together with exchange rate instability, are having a negative impact on the short-term outlook of the steel industry in industrialized countries. Japan continued to enjoy strong internal market conditions during the first half of 1991, which resulted in a cumulative increase of 4.0 per cent in Japanese iron ore imports over the same period in 1990. Conversely, in North America, recessionary conditions seriously affected the level of steel output, which declined by nearly 13.5 per cent in the United States from January to May 1991. By the end of June, however, there were signs that the United States recession might have ended, even if no measurable expansion of the American economy had yet begun.[32/] In the EEC, the weakening of steel demand was continued during the first half of 1991 and steel production was 2.8 per cent lower during the January-May period compared with the same period in 1990.

104. The end of the Gulf war has not resulted in any significant increase in steel demand in developed market-economy countries.[33/] In addition, in the USSR and other Eastern European countries both steel production and consumption continued to decline sharply. As a result, despite the increases in crude steel output in China and the Republic of Korea and the recovery in Brazil, worldwide crude steel production during the first half of 1991 was more than 4 per cent below its level during the same period of 1990, according to the figures from the International Iron and Steel Institute. Nevertheless, a slight upturn in overall economic conditions in developed market-economy countries during the last quarter of 1991 is expected and may alleviate the overall decline. For the iron ore market, steel developments in 1991 can be translated into a decline, but not a disaster, particularly because stocks have to be rebuilt.

105. In 1992, world steel demand is expected to start rising again, and a good recovery is predicted for 1993-1994.[34/] It is unlikely that the iron ore market will experience significant changes in 1992, and small fluctuations may not greatly affect the firmness of world demand, although the world iron ore industry should carefully match planned additions of new capacity with the gradual closures of depleting mines, with a view to maintaining the current balance between supply and demand. Iron ore prices are expected to strengthen further in order to allow the necessary investments required to avoid possible iron ore shortages in the 1990s.

Notes

1/ See OECD Press Releases of the Steel Committee: SG/Press (91)7 - 30 January 1991, and SG/Press (91)23 - 22 April 1991.

2/ Information collected by the United Nations ECE secretariat, based on national statistics provided for the ECE Common Data Base.

3/ See ILAFA, "Una decada perdida" Siderurgia Latinoamericana, March 1991.

4/ The study, Recycling Opportunities published by Leading Edge Reports in 1990, reviews metallic and non-metallic recycling metals markets.

5/ See UNCTAD, "Iron ore statistics 1981-1990" (TD/B/C.1/Iron Ore/7), Table 5, Sinter Production.

6/ D.F. Anderson, Director of Economic Studies of the International Iron and Steel Institute, addressed the question of the availability of the different iron ore products during the fourth session of the Intergovernmental Group of Experts on Iron ore, held in 1990.

7/ Reference is made to the paper "Technical and commercial prospects for iron ore in direct reduction" presented by G. Branning from Midex Corporation at the Metal Bulletin 7th Iron Ore Symposium, 1991.

8/ Reference is made to a recent study on "The African iron ore industry in the 80's and perspectives for the 90's", prepared jointly by the Economic Commission for Africa and UNCTAD for the Fourth Regional Conference on Mineral Resources Development and Utilization, held in Ouagadougou in March 1991.

9/ Information provided during the meeting of experts on the steel market, convened by the United Nations Economic Commission for Europe, February 1991.

10/ See: "Soviets seek iron ore partners", American Metal Market, 31 July 1990; "Soviets open some mineral deposits to joint ventures", Mining Engineering, August 1990; "USSR seeks foreign partners for ore projects", Metal Bulletin, 9 August 1990.

11/ Reference is made to the presentation made by E. Zuniga, Chairman of the Board of Hierro Peru, on the "Future prospects for Hierro Peru and its privatization" at the Metal Bulletin 7th Iron Ore Symposium, 1991.

12/ See "The state of North America iron ore", by W. Calfee, Senior Vice President of Cleaveland-Cliffs Inc, presented at the Metal Bulletin 7th Iron Ore Symposium, 1991.

13/ See B. Boyd, "Canadian iron ore industry in 1990", Skilling's Mining Review, March 9, 1991.

14/ See: "Resources for the 90's and Beyond", by L.A. Dean and I. Mac Donald from BHP Iron Ore, presented at the Metal Bulletin 7th Iron Ore Symposium, 1991.

15/ In addressing the issue of investment costs, Mr. Issa Ahmadeu, Director of SNIM (Société Nationale Industrielle & Minière of Mauritania), stated in his paper "Future prospects for SNIM and the development of its new deposits", presented at the Metal Bulletin 7th Iron Ore Symposium, 1991, that for the period 1990-1994, the investments required by his company "will generate debt servicing in the amount of $US 50 million, i.e. 25 per cent of the 1990 turnover."

16/ UNCTAD's previous reports in this series have already discussed this issue, in particular in paragraphs 71 to 73 of its 1989 market review (TD/B/IPC/IRON ORE/AC.1/14) and in paragraphs 82 and 83 of the 1990 report (TD/B/C.1/IRON ORE/2).

17/ See: "Mines attack iron ore price system", Metal Bulletin, 18 April 1991, referring to the opinion of iron ore producers expressed during the 7th Metal Bulletin Iron Ore Symposium.

18/ A more detailed analysis of the evolution of iron ores is presented in the UNCTAD report entitled "Impact of structural and technological changes in the iron ore market" (TD/B/IPC/IRON ORE/AC.1/5), August 1986.

19/ A number of papers addressing the question of phosphorus removal were presented at the 51st University of Minnesota Mining Symposium, held in 1990.

20/ The Raw Materials Committee of the International Iron and Steel Institute examined the recent technologies for sintering and pelletizing during a "Seminar on Sinter and Pellets", held in 1988, the synopsis of which was published by the IISI.

21/ See The role of technology in iron and steel developments (OECD, 1989).

22/ Reference is made to a number of papers presented at the International Symposium on Direct Reduction held in the Libyan Arab Jamahiriya and organized by the Arab Iron and Steel Union, December 1990.

23/ See "Everything you wanted to know about hot briquetted iron", Direct from Midex, Volume 15, Number 2, 1990.

24/ A paper entitled "The COREX process at ISCOR's Pretoria works" was presented by ISCOR Ltd. at the Metal Bulletin 7th Iron Ore Symposium, 1991.

25/ See Robert A. Garvey (President, North Star Steel Co.), "North Star examines iron carbide", Metal Bulletin Monthly, March 1991, and "Cliffs eyes iron carbide as DRI alternative", American Metal Market, March 1991.

26/ See: "The possible impact of new ironmaking processes on iron ore market" by J. Astier, presented at the Metal Bulletin 7th Iron Ore Symposium, 1991.

27/ In November 1990, in the United States the new Clean Air Act imposed new environmental rules aiming at reducing coke oven emissions and controlling acid rain. As a result, 40 per cent of the existing coke ovens in the United States iron and steel industry will apparently have to be replaced by the year 2003. In Brazil, according to a recent report by Setepla/Tecnometal, under the privatization programme steel mills are presently required to disburse in some cases up to 15 per cent of their potential bid price to comply with the environment protection legislation.

28/ Reference is made to the conclusions of the study "Recycling opportunities" published by Leading Edge Reports in 1990, as well as to several articles on ferrous scrap matters, including: "Scrapping Scrap", Metal Bulletin Monthly, March 1991; "Two faces of scrap", Metal Bulletin, May 17, 1991; "Scrap preheating fuels energy savings", Iron Age, December 1990; "Regulating fora greener more complex world", Metal Bulletin, 29 November 1990; "Steel dominates metals scrap market", Steel Times, May 1990; "The right reasons for recycling" Iron Age, June 1990.

29/ The Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and their Disposal has been signed by 53 countries. It will become law within three months of its being ratified by a minimum of 20 countries.

30/ According to the study "Scrap and the steel industry", published by the International Iron and Steel Institute in 1983: "Most scrap classification systems have been drawn up after consultations between consumers and suppliers. The two major classification criteria are chemical and physical. The chemical criteria include the levels of residual elements such as chromium, nickel, molybdemum copper, tin, lead, zinc, phosphorous and sulphur. The physical criteria are dimensions and density."

31/ See "Unpaid cost of pollution control" Gazeta Mercantil, 12 November 1990.

32/ See OECD Press Release "The steel market situation in OECD countries" (SG/PRESS(91)23, 22 April 1991.

33/ Reference is made to the statement made by the Chairman of the Federal Reserve Board of the United States, as reported in "FED asserts the recession may be at an end, or nearly so", New York Times, 19 June 1991.

34/ See: "Accelerating change threatens traditional producers", by Peter F. Marcus and Karlis M. Karsis, presented at Steel Survival Strategies VI Conference, held in New York in June 1991.

Annex I

IRON ORE MINING PROJECTS: NEW MINES AND CAPACITY EXPANSIONS - 1991

Company	Location	Planned capacity	Investment ($ million)	Start	Notes
Africa					
SNIM	Tazadit, Mauritania	-	10	1991	OR: 20MM - Project extension
	M'haoudat, Mauritania	6 MM mt/yr ore	160	1993	OR: 80 MM at 64% Fe-lumps/fines
MIFERGUI	Nimba Mts., Guinea	6-9 MM mt/yr ore	220	1993	OR: 1,500MM at 66.7% Fe-fines
MIFERSO	Faleme, Senegal	6-10 MM mt/yr ore	776	1990s	OR: 610MM 62% Fe.lumps/fines. Includes a railroad and port facilities
Asia					
Government	Several locations, China	-	128	1995	- 13 Projects: 8 new mines and 5 capacity expansions
North and Central America					
Sicartsa	Lazaro, Mexico	3MM mt/yr pellets	104	1990s	- Expansion programme
	Lazaro, Mexico	3MM mt/yr conc	300	1990s	- " "
Minera del Norte	Sierra Mojada, Mexico	0.5 MM mt/yr conc	10	1992	" "
Inland Steel	Gilbert, Minnesota, USA	-	20	1991	- Develop taconite reserves
South America					
Ferrominera	Porto Ordaz, Venezuela	7-22MM mt/yr ore	-	1991/95	- Expanding and modernizing facilities to reach 25-40 MM.
		3MM mt/pellets	250	1993	- To maintain pellets exporting capacity.
MBR	Minas Gerais, Brazil	2.5MM mt/yr ore	38	1995	- New sinter-feed capacity
Samarco	Minas Gerais, Brazil	12MM mt/yr ore	50	1994	- Replacement to continue operations of the existing plants.
Oceania					
Hancock Mining	McCameys, Australia	2-5MM mt/yr ore	-	1990s	- Commitment decision pending
BHP Iron ore	Yandicoogina, Australia	5MM mt/yr ore	100	1992	- OR: 200MM at 58% Fe.fines
Hamersley Iron	Marandoo, Australia	5-10MM mt/yr ore	475	1994	Replacement-OR:313MM at 62% Fe
Hamersley Iron	Brockman No.2 Australia	3-5MM mt/yr ore	50	1992	- New project

Source: UNCTAD secretariat based on the work of the Intergovernmental Group of Experts on Iron Ore.
Notes: The information provided is not exhaustive; additional information and revisions are welcomed.
OR = ore reserves MM = million M = thousand mt = metric ton $ = US dollar

Annex II

IRON ORE MINING PROJECTS: CLOSURES AND CAPACITY REDUCTION - 1991

Company	Location	Reduction of capacity	Effective or planned date	Temporary (T) permanent (P)	Notes
Africa					
LAMCO	Yekepa, Liberia	6.5 MM mt of ore	1991	P	- Final 3 MM mt may be mined by ACM (African Mining Consortium) in 1991
North & Central America					
Algona	Wava, Ontario, Canada	1.1 MM mt/y ore	March 1992	P	- Pending final decision
La Perlaminas	Camargo, Mexico	1.5 MM mt/y conc.	1991	P	- Depletion
EUROPE					
SSAB	Dannemora, Sweden	0.6 M mt/y	Dec. 1991	P	-

Source: UNCTAD secretariat based on the work of the Intergovernmental Group of Experts on Iron Ore.

Notes: The information provided is not exhaustive; additional information and revisions are welcomed.
MM = million M = thousand mt/y = metric ton a year